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STUDENT BLANKET TAX PRESENTED

Alumni Council hears the carefully prepared report of the undergraduate Committee and appoints a committee to report on it

The annual meeting of the Alumni Council was held at the Engineers Club, January 29. The salad orator was Professor Lewis who spoke of the work that is being done by Professor Noyes, '86, on the nitrogen supply for the United States government. President Hart was in the chair.

It was voted that, subject to the approval of the President of the Institute, the Executive Committee of the Council be allowed to appoint each year alumni committees to visit and report to the Executive Committee of the Alumni Association on the condition of the various departments of the Institute. Secretary Humphreys reported that it would be necessary to change the constitution in order to make a change in the requirements for representation on the Council of local associations. Inasmuch as some other changes have been considered it was decided to appoint a special committee to canvass the matter and to review both the constitution and the by-laws. The committee appointed consists of J. P. Munroe, '82; Everett Morss, '85; Frederic H. Fay, '93.

An informal ballot was taken for members of the nominating committee. The three men receiving the highest votes were A. Farwell Bemis, '93; Merton L. Emerson, '04; George B. Glidden, '93.

The annual reports from the various committees were received and will be found in the Review for April.

John M. deBell, '17, president of the senior class, with four other undergraduates, E. P. Brooks, P. C. Leonard, L. L. McGrady, and R. W. VanKirk, were guests of the Council and have been invited to present the proposed blanket tax which has been discussed by the student body during the year. Mr. deBell made a splendid presentation of this matter which contemplates the financing of the undergraduate association. The student committee made a long and very thorough investigation and has come to the conclusion that an assessment of $6.25 will adequately meet all the expenses of the association. The report in part is as follows:

In attacking this problem, your committee has chosen those items of expense which it believes should be borne equally by the students; these have been grouped and investigated under five separate heads, as indicated below. Your committee believes that the Undergraduate Association should pay—

A. The expenses of the Institute Committee, including (1) the office and incidental administration costs of the committee and its several sub-committees; (2) the cost of all-Technology gatherings, such as CourTnyte.

Three hundred dollars a year would be sufficient to meet these requirements.

B. A definite amount to each class. It seems advisable that dues which have

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hitherto been paid directly to the classes should be included in the Undergraduate Association dues, for these reasons: (1) All men should pay their class dues, for (a) only in this way are the financial burdens of the class fairly borne; (b) the classes in which the greatest percentages of members have paid their dues have done the most for the Institute; (c) 100 per cent payment of dues would mean heavier voting at elections, and consequently would ensure representative results through the Institute Committee; (2) this system of collection would be an improvement over the former one, for (a) it would eliminate the great time and energy waste of unsystematized effort; (b) the class would be sure of a definite adequate income and its board could spend its time in planning the most efficient distribution of the money; (c) the responsibility of financial administration would still be borne by the class governing board, while the Institute Committees check would be an added incentive to proper handling and accounting for the funds; (3) this system of collection with the Undergraduate Association dues would be most expedient, for it would make only one collection necessary, and this would be efficiently handled.

One thousand four hundred dollars a year would be sufficient for supporting the classes, based on the following division:

Freshmen	$350
Sophomores	350
Juniors	280
Seniors	200
Permanent fund at graduation	220
	$1,400

C. The expenses of maintaining athletics. It is proposed to continue varsity athletics as they are at present, but to lay especial emphasis on providing agreeable exercise facilities for the large number of undergraduates who are not of varsity caliber. The latter plan would be accomplished by encouraging interclass and intercourse competition.

Exercise is advisable for all students, to keep them in proper physical condition to meet the requirements of the Institute curriculum. The desirable conditions are most likely to be fulfilled if all possible types of exercise are maintained, so that the student may choose that form which appeals to him, after finishing his first year's compulsory training. The capitalization of the facilities has already been largely handled by the Institute, but the maintenance should be borne by the Undergraduate Association.

Varsity athletics carried on moderately, as they are now, will (a) continue to advertise the Institute favorably; (b) provide incentive for the class and course contests.

Four thousand five hundred dollars a year, with receipts from Tech Show, would support athletics in a satisfactory manner.

D. A portion of the maintenance of the Walker Memorial. The maintenance of that part of the Walker Memorial not used for dining service or gymnasium should be borne by those for whom the building was provided. The total expense of this part has been estimated as follows:

Lighting and heating	$1,920
Janitors, window washing, etc.	1,800
Attendants	1,280
Upkeep of games	900
Depreciation of inside fittings, not including games	1,800
	$7,700

The income to meet this expense would be approximately:

Gross receipts from games	$1,400
Cigar, candy, postoffice, net	600
350 associate members (instructing staff and alumni who would use the building) at $5	1,750
Undergraduate Association	4,000
	$7,750

This calls for Undergraduate Association expenditures of $4,000, as compared with one of $8,000 which was recommended to the Corporation of the Institute by the Alumni Walker Memorial Committee.

E. Health insurance—the provision of adequate medical attendance. Under this plan, a doctor would be in daily

attendance for free consultation and advice to the students. It has been deemed advisable to include health insurance in the proposed dues for the following reasons:

1. For the payment of a small sum, every student is assured free medical consultation and advice whenever he desires it. This will tend to cause men to consult the physician on slight provocation, thus greatly minimizing the danger of serious illness or epidemics.

2. Cases like the Field Day accidents will be treated free of charge to the individual.

3. Home treatment can be secured at rates much lower than the student could get independently.

4. The increasing number of cases of illness and accident, and the concentration of students in the dormitories, makes more adequate supervision of the health of the student more desirable.

The cost of maintaining such health insurance, exclusive of first aid facilities, which we believe should be furnished by the Institute would be one thousand dollars a year.

The summarized expenses are:

Institute Committee	$300
Classes	1,400
Athletics	4,500
Walker Memorial	4,000
Health insurance	1,000
	$11,200

With regard to the raising of this sum, two questions present themselves:

1. How should the money be raised? And, since it must almost certainly come from the student body,

2. How shall it be collected?

Your committee feels that the only equitable way of meeting the expense is to have it equally borne by all members of the Undergraduate Association; and it consequently recommends that annual dues of $6.25 be paid by each member of the association. It further recommends that the Institute Committee petition the Corporation to collect the dues, as a part of the regular Institute expense, with tuition, dividing the sum between the first and second terms as may be found advisable. With regard to first-aid provisions, the committee recommends that the Corporation be further petitioned to provide and equip a first-aid room. This could be done for about two hundred dollars.

In case the Institute Committee cares to consider the plan of this committee, it is felt that several pertinent facts should be pointed out, notably the advantages of the dues system to the Undergraduate Association, and its flexibility to meet the demands of increased membership.

The advantages to the Undergraduate Association are:

1. The system provides an equitable sharing of financial burdens, at a minimum cost to the individual.

2. It provides a convenient and efficient means of payment.

3. It eliminates possible control of any all-Technology function or activity by a private organization.

4. It increases the interest in undergraduate affairs of those students who are at present non-participating.

5. It provides for payment by the association of expenses which are justly its own.

6. It furnishes to each member of the association these specific privileges:

(a) Membership in the association, with the right to hold office in the Institute Committee or the activities which compose it; and the right to be heard in the Institute Committee.

(b) Suffrage rights in the classes.

(c) Free admission to Field Day and all athletic events held on Technology grounds.

(d) The right to use any of the athletic facilities supplied by the association.

(e) All privileges of the Walker Memorial.

(f) Free consultation with a physician, free treatment for accident or illness incurred in service for the Undergraduate Association, and other treatment at reduced rate.

The method of collection is deemed advisable because:

1. It is most convenient and efficient for all concerned.

2. Being advertised in the Institute bulletins, it will not appear to new men to be an extra, unexpected charge.

3. It will eliminate the necessity of expending great time and effort in educating the entire student body to the point where 100 per cent. of them will realize the necessity of such dues.

4. It has proved its value in institutions of higher education all over the country. Although your committee believes Technology is capable of independently meeting its problems, it nevertheless believes a thorough knowledge of conditions at contemporary institutions to be advisable, and has therefore compiled statistics of thirty-five colleges, with the following result.

In order to benefit by the experience of other American colleges along the line of a compulsory student tax for undergraduate activities, your committee has been in correspondence with some fifty colleges. These institutions have been chosen as representing the small, large, purely academic and purely scientific colleges of the country, and the data obtained we feel to be very representative of the status of taxation in American colleges. Replies are as follows:

Number of replies received	35
Number with tax compulsory by college authority	18
Number with tax compulsory by strong sentiment	6
Number with no tax	11
Average tax in eighteen colleges by compulsion	$6.70
Average tax in six colleges by sentiment	10.15
Average tax in both	7.60
Average amount going to athletics	6.10

In seven out of the twenty-four colleges the tax was for athletics alone. In nearly all of the eleven colleges having no tax it was stated that their receipts were more than enough to pay expenses, thus making unnecessary any athletic tax which seems to be the principal item in the other college taxes.

As income and expenditure would, practically throughout, vary directly as the student registration, it would be advisable, in the absence of extraordinary circumstances, to increase the expenditures of the five groups in the same ratios. This would be equivalent to reducing the cost schedule to the following per capita basis, assuming a membership of 1,800 requires the above estimated funds:

Institute Committee	$0.17
Classes	.78
Athletics	2.50
Walker Memorial	2.22
Health insurance	.56
	$6.23

Your committee has collected the accompanying material, of which it will file a detailed report, should the Institute Committee desire to use the same in petitioning the Corporation. It also wishes to thank the Institute Committee for this opportunity to gather material which it believes will be of value to the Institute.

Very respectfully submitted,

THE COMMITTEE ON WAYS AND MEANS.
Edward P. Brooks, '17, *chairman.*
Paul C. Leonard, '17.
J. W. Doon, '17.
J. M. deBell, '17.
R. W. Van Kirk, '18.
L. L. McGrady, '17.

There was some little discussion on the conclusion of the report as to whether it was right and proper to create a tax that should be obligatory on all students as some of them have to make great sacrifices to pay for their tuition and the other necessary expenses. The students called attention to the fact that it is in reality the poorer students who are most punctilious about paying dues and the well-to-do who neglect to pay them. It was urged that this was a systematic and business—like way of providing for payment of the obligations of the students and would save an enormous amount of time now used in collecting dues. It was voted to refer the matter to a special committee of five members to report to the Council at the next meeting. The committee consisted of Henry J. Horn, '88; Jasper Whiting, '89; Henry A. Morss, '93; Russell White, '16; John M. deBell, '17.

ANNUAL ALUMNI BANQUET

Technology's duty to the National Government presented in its various phases

The annual dinner of the Alumni Association of the Institute was held at Hotel Somerset, January 6, 1917; the subject chosen for discussion was "Technology's Duty to the National Government," the subject being divided into two parts, "Technology and Research" and "Trained Minds for the Future Problems of the Nation."

President Charles A. Stone, '88, of the alumni association acted as toastmaster, and introduced as the first speaker, President R. C. Maclaurin, whose address follows:—

It is usual on such occasions for the President of the Institute to review the main events of the year that has just closed. The year of Mr. Stone's presidency will always be memorable in the history of the Institute, and the success of the various enterprises of that year have been due in large measure to the unstinted devotion of the alumni to their alma mater. These achievements have, however, stood out so clearly that it must be unnecessary for me to refer to them here. In what I have to say, therefore, I shall look, with your permission, rather to the future than to the past. There is, however, one matter of past history of which I should say something, as full information regarding it has not yet been given to the alumni. All who were present will remember the closing hours of the great reunion in June that was coincident with the dedication of our new buildings. On that occasion I announced the latest benefaction of Mr. "Smith" in the form of an offer to contribute five dollars towards a building fund for every three dollars that others would contribute towards the endowment of the Institute, his contribution being limited to two and one-half million dollars, and the time for securing the full benefit of his offer expiring on the first of January. The campaign for securing the million and a half for endowment was, as you know, brilliantly begun by the generosity of a small group of alumni—the du Ponts, Mr. Stone and Mr. Webster, Mr. Adams and Mr. Hayden—who contributed a million dollars. The members of the Corporation took hold of the problem of raising the remaining half million. Of course the last half million always presents the greatest difficulties, but these were all successfully overcome and the whole amount of four million dollars has already been paid into the treasury of the Institute. You might be interested in a complete list of the contributors, but for the present I shall refer to only four. Two hundred and fifty thousand dollars came from Mr. John D. Rockefeller through the General Education Board, and $100,000 from an anonymous benefactor in Boston (not Mr. "Smith") who has already made large contributions to the Institute. Especially gratifying was the establishment of an Endowment Fund of $25,000 given to the Institute by the friends of the late Alexander S. Wheeler, long a member of the Institute Corporation. This fund is to be permanently associated with the name of Mr. Wheeler. Another specially gratifying contribution was that of $15,000 for the establishment of a lectureship in business management, the lectureship being associated with the name of the late Frederic T. Towne, of the class of '94. This fund was supplied by Mr. Henry R. Towne, of the Yale & Towne Manufacturing Company, and by a classmate of Frederic Towne.

Now having received this million and a half dollars for endowment, what are we to do with it? There will be little difficulty as to that. Part of it will be required to take care of the cost of maintaining the buildings that are now occupied which are so much larger than our

old buildings. Unquestionably the next charge upon the fund must be the raising of the salaries of the instructing staff which, especially in these days of the high cost of living, are unquestionably far too low. When this condition has been even partially corrected there will be nothing left of the income from the special endowment fund that has just been raised.

If we were to pause for a moment to take stock of the Institute we should find it in an immeasurably sounder condition than ever before. It has a splendid and well-equipped plant on a magnificent site well adapted to present needs and for future expansion. Its endowment is much less inadequate than ever before, although in these days of extraordinary opportunities new advances involving enlarged expenditures are always in view. It is stronger than ever before in the esteem of the community and, what I think is of special importance, it is steadily improving its national and international position. Students come to it from every part of the Union, and the Institute has more than twice as large a percentage of foreign students as any other institution of university grade in the country. The great problem of the Institute as I see it is to make it even more distinctly national and there is surely no reason why two such institutions as Harvard and Technology in combination should not maintain the greatest school of applied science not only in the nation, but in the world. In line with the policy of nationalizing the institution, you may have observed in recent years that new members of the Corporation have constantly been selected whose interests are national in their scope. To mention only a few amongst the more recent additions to the Corporation: Mr. Theodore N. Vail, Mr. W. Cameron Forbes, Mr. Howard Elliott, Mr. Pierre S. du Pont, Mr. Frank A. Vanderlip and Mr. Otto H. Kahn. In this work of nationalizing the Institute the alumni must take an active part, and I commend this general problem to the consideration of your Council. It is clear, of course, that the only permanently effective means of maintaining a national school is to train men in such a way that they can be of service anywhere within the nation. There is undoubtedly no part of the United States that does not urgently need and will not continue to need a large supply of men with a sound scientific training, and the demand for men so trained will unquestionably grow greatly in intensity in the near future. In this connection let me read to you an extract from a letter recently received by me from Mr. "Smith":

"When my first contribution to the M. I. T. was made, I had been carefully looking over the field for some time. I formed the opinion that there was no other place where a large sum of money could be invested with more effectiveness. That opinion has not since been changed in the least, in fact it was the growing strength of this conviction that led me to make my second subscription. I heartily congratulate the Corporation and you upon the broadmindedness and at the same time the conservatism with which the building plans have been carried out. I naturally feel great satisfaction in being instrumental in helping you to carry out such far-seeing plans for the development of the Institute, as I feel very strongly that the progress of this country is to be affected greatly by the men who are turned out of the M. I. T."

Time, of course, does not permit me even to touch upon the various ways in which the progress of this country will be affected by men who come under the influence of Technology. At present I can touch on only two phases of that great question. The first of these is the problem of research that has already been dealt with by one so well qualified to speak on the subject as Doctor Whitney, the director of the research laboratories of the General Electric Company. His position points the way to an inevitable development of the future. All over the country there must grow up in connection with almost every great industry large departments of research and one of the great problems of scientific education today is to prepare an adequate supply

of men who can fill the positions that will thus need to be filled. These departments of research will be absolutely indispensable to progress and even to existence in view of the competition with other nations that will inevitably follow the war. It is a mistake to suppose that these research laboratories will be filled with geniuses. A genius of the right type is, of course, a priceless possession, but there are never enough of these to go around and happily great advances can be made without them. What is particularly needed is a *large* supply, and I emphasize the word "large,"—a *large* supply of men with a sound knowledge of the fundamentals of science and trained to careful observation in the conduct of research. We must develop our vast series of laboratories at the Institute in such a way that every one of them not only gives promising men an opportunity for research but actually trains them in the business.

If I may use the language of the war, our progress during recent years has been made by a series of drives. We began by a successful drive on the Commonwealth of Massachusetts for a contribution that would enable us to attempt much larger operations. The next drive was a relatively short one to secure funds for a new site, then came the great drive extending over years to secure the erection and equipment of our buildings. The last six months has witnessed a drive for a four million dollar fund for special purposes. The great drive now must be for research, and here where, of course, we shall need money, we shall need much more than money—the earnest and careful consideration of the problem in all its phases and the active coöperation of all who are really interested in the problem. I have already presumed too long upon your patience, but there is one other aspect of the problem presented in Mr. "Smith's" letter that I should like to dwell upon, however, briefly. The problem is, how can the Institute contribute to the progress of the country as a whole? It is, I hope, agreed that it must do this by keeping to its proper domain of training men. It is agreed also that for the most part that training must be along the lines of science and the applications of science to all the actual problems of the Nation. I need not enlarge to you on the merits from the point of view of national need of the Institute's training, but there is one aspect of that training that is in my judgment not sufficiently emphasized even amongst Institute men. The most valuable and permanent results of any training are often what may be described as its by-products. Science is good in itself and the really scientific spirit is of inestimable value. It is valuable to the individual and valuable to the race, and to no race more valuable than to ours. If you look at this country today and compare its condition with the countries with which it must compete after the great war, you must recognize that all the advantages are not on our side. The countries at war are going through a priceless discipline of stern experience. We are in danger of being ruined by a prosperity that is largely accidental, being due in very small measure to any merits of ours, this prosperity encouraging what was always a dangerous feature in our national character,—a spirit of thriftlessness and extravagance. The nations at war are being forced by their circumstances to the utmost economies and the most careful forethought of the morrow. This is enormously to their advantage in the long run, and we shall inevitably suffer, and suffer bitterly, in our competition with others unless we can find means of arresting what appears to be becoming a national habit. Under these circumstances it sometimes seems to me that the greatest merit of a training such as Tech affords is that it not only forces men to look ahead, but produces in them what I may describe as the habit of economy, not in a personal but in a larger sense. The men trained as Tech men are trained to look naturally for means of saving waste and in due time waste becomes so hateful a thing in itself that men's best energies are devoted to avoiding it. This, I think, is one of the reasons why Mr. "Smith" is right in saying that the progress of this country is to be affected

greatly by the men who are trained at the Massachusetts Institute of Technology.

The second speaker, introduced by President Charles A. Stone, '88, was Dr. Willis R. Whitney, '90, member of the United States Naval Consulting Board, whose interesting paper is given below.

DR. WHITNEY ON "RESEARCH"

I want to talk about pure research because we Americans seem to know so little about it. Nothing in the world is so important to engineers. Although ours is the greatest engineering school, it is the home of few research men.

Since the war began we have all taken inventories. We see that there is need on every side for national planning which shall extend beyond the four years for which our political parties are separately responsible. Our nation will not mature under a single administration. National policies should be planned for long periods. The part which I want to talk about tonight is the advancement of science, and the improvement of Americans by our Institute.

Because of the inherited conservatism of systematized teaching, radical steps are slow. But William Barton Rogers, in establishing this Institute, did something radical. Men were to be taught by contact with things, instead of being merely told about them by teachers—the custom of a thousand years. A great technical school resulted. It prepares men for useful work in trade and industry, but neither this nor any other American school is doing enough to read the countless uncut pages of science or to lay the foundations of the future engineering structures.

Even if research had no greater value than its application to engineering, much more of it ought to be done at this institution. If working into new levels of Nature's infinite mines merely made students brighter, or teachers more interesting, there would be ample warrant for research. But there are better reasons. Some are instinctive and as difficult of analysis as are our reasons for developing at all.

Man seems to be the supreme, mentally elastic organism. He develops by trying novelties and by taking new paths. No one knows to what extent he may develop, but everyone knows that through acquisition of knowledge, or, let me say, production of it, he may transcend any physical limits. This will not come about by continuous repetition of what we have already learned. Monkeys and parrots do as much. It will come through the continual and active appreciation of new knowledge. In national mental development we might be wise to learn to do as well as Germany has done until we can do better. In most every little town of the Empire there is a university. In almost every university there are several thoughtful professors, and in almost every professor there is a research man of high order. Such has been the condition for two score years. During that time a large part of the basic knowledge of our engineering has come from these people, whether it be the engineering of the physician, the chemist, or the electrician, or the engineering of music, economics, or religion. Every one of these professors delved patiently in his university laboratory, using his own and students' hands, and his lectures were far the lesser part of his work. Such men teach by example, and produce others like themselves by contagion. When the student has in turn contributed to new knowledge, and only then, he may become a doctor, and in Germany this means something real. When this doctor has later shown great originality and productivity, he may become a professor, and that means "wie ein Gott"—only a little lower than a Kaiser. Do not make a mistake here, of laughing at the funny foreign facts. Maybe *we* are funny, and slow to see it. When I "made my doctor" in Germany, a laurel wreath was put at my place at table. In America, I should have had to buy a box of cigars for the boys.

A professor with us is a conscientious alumnus a little older than his assistants. He is often stunting his mental growth on a salary that a chauffeur would scarcely accept. He is not expected to be a constructive scientist, nor a real worker in

science. He is not asked to show boys how new things may be done by doing a few of them. He must confine himself to talking about accomplishments of others, usually foreigners. We rail at him, but do not help him at all. The fault is not his. He was raised as a part of the system which we, in our poverty, have had to employ.

In the advance of civilization it is new knowledge which paves the way, and the pavement is eternal. While the physical structures of man are decaying, the facts he is learning are ever doing new service. Anti-toxic devices will be increasing when locomotives are forgotten. Magnetic induction will work after the pyramids have blown away. We ought to see that everything distinguishing our lives from those of Indians has come from studying something new.

As we grow in years and wealth, we ought to grow in wisdom and knowledge. H. G. Wells, who wrote "Mr. Britling Sees it Through," once made some notes on Boston which have enough of fair criticism of our immobility to warrant repeating. He says: "There broods over Boston an immense effect of finality. One feels in Boston as one feels in no other part of the states, that the intellectual movement has ceased. . . . Over against unthinking ignorance is scholarly refinement (the spirit of Boston); between that Scylla and this Charybdis the creative mind of man steers its precarious way."

The creative mind of man steers its precarious way, and there is little reason for it but habit. We are not too old to grow the creative mind. England, France, and Germany do it. We here are not too young, because western universities are doing it in some lines.

In many countries there exist today classes of men who devote their lives to public welfare and are kept from starvation by long established customs of community support. They are never satisfied with what is already known, but they themselves want to extend the known with an ardor which is perpetual. They are usually professors.

Most of the foundations of the world's great advances in knowledge have been laid by men who were set apart and supported by the government, or some more or less public institution, where, for very long periods (usually for life), they were encouraged to delve into the unknown. Think of Davy and Faraday in the Royal Institution; of Graham, Ramsay, Rayleigh, J. J. Thomson, and Kelvin, in English institutions; of Pasteur in the Sorbonne and Pasteur Institute, of the Curies, of Dumas and Berthelot and others of France; of Helmholtz, Bunsen, Hertz, Wöhler, Hofmann, Ostwald, Haber, and others, in German universities; of Berzelius, van't Hoff, Mendelejeff, Arrhenius, and a score of men from the universities of other countries. Most of these are professors of physics or chemistry of our time. They were in some way supported in their research work by their country. How many such cases can we cite for America? In a few colleges, one or two men are now permitted to carry on a little research work, when it does not interfere with routine teaching. It was not long ago that research, if done at all in some of our colleges, had to be done surreptitiously. At this same time, other countries were paying their best scientists to continue research, and schools of research were being maintained in almost every large German and French city.

When Professor Hertz was making observations on the effect of one spark gap on another at a distance, and concluded that he was dealing with electric waves in space, he was not trying to improve the telegraph or telephone. He was like an inquisitve child, making what to him were interesting experiments. He was well trained to observe, but otherwise he was like a youth guided solely by the interest in the new things he was finding. When he had added to knowledge the few simple facts which he observed, he had laid the foundation for a Marconi. His ability was no accident, his service no unsought nor unsupported thing. He had been trained by Helmholtz, and all his life he was employed in German universities to do pure research work and to encourage others to do it likewise. This is the important point.

It is not realized how generally the world's greatest discoveries were disclosed in their first stages by men who were highly trained and experienced in experimenting. I want to emphasize this point. The long strides in advance are made by careful, painstaking observations of matters not at the time particularly promising or comprehensible to the layman. The foundations are most often made by experimenting science professors, who, with mind skilled in observation and keen in appreciation, have had opportunity to long continue the investigation of some phenomenon of Nature which they observed. We Americans must get out of our minds the thought that our part is harvesting the wheat we have grown on our virgin soils. Something has to be cultivated, something planted. We must learn that improvements of great human interest are not accidental, fortuitous, or free from extended exertion.

We are generally superficial. The interesting lives of a few exceptionally able American inventors have led us to overprize engineering short cuts. We are patenting inventions at the rate of nearly 50,000 a year, but very few Americans are advancing the sciences at all. We need to be told that beneath national supremacy must lie some sort of national foundations, and if we are considering technical, industrial, or engineering supremacy, we must expect to need some constructive work in bases of physics, chemistry, electricity, biology, etc.

The benefits of anaesthesia, for example, are due to the experiments of Priestley on gases, which led Davy to play with nitrous oxide. Then, by experiment, he discovered its power of producing insensibility to pain. Faraday showed that ether acted similarly; Dr. Morton, in Boston, also disclosed its applicability, and, finally, anaesthetics came into general use. The research men were at the time trained chemists merely trying things for the pleasure they obtained in learning something new, and they had been practicing this scientific observation and chemical experimentation all their lives. Thus they appreciated the value of the new facts and tried many experiments to add to the knowledge already gained. And they had time to do it and were paid to do it. In this connection, Sir James Simpson, who introduced chloroform into anaesthesia, early showed a peculiar talent for medical observation and research. He was a well-known professor in Edinburgh, a trained experimenter. If we take a step further back in this field, we find the chloroform itself discovered as a new chemical compound by the well-known university professor, Liebig. He was trained and supported all his life for doing just such things. He was the first of a long series, and he made many such contributions to our welfare.

It is for such reasons that we want to see more chemists and physicists trained in our schools than are absorbed in our present industries. We need them much more generally in scientific research laboratories, in the college or elsewhere, where the country's future interests are concerned.

The trying of new things which made the telephone possible was done by Faraday when he studied the effect of one electric current on another and disclosed the general laws of magnetic induction. His was no untrained mind suddenly awakened by a gracious Nature with a useful discovery in her outstretched hands. He was studying a lot of little effects which all practical men of his day would have said were meaningless and useless. The world holds an infinity of just such phenomena still unstudied, but it does not support many such investigators. Taught to experiment by a Davy, and retained in a position in the Royal Institution, he was in command of his own time and adequate apparatus for scientific research over a period of two score years. This cost the Royal Institution of Great Britain yearly not over $2500.

People have already nearly forgotten that aeronautics owes its present development to the trying of certain new things by Professor Langley. No one took any stock in his early studies on the rate at which little cardboard planes would fall, if given a certain slant and a certain lateral speed in the air. His studies had

been published for years, but no one used them. At that time aviation certainly seemed more possible through the use of balloons, of lifting propellers, or of waving wings, than through any other means. Langley finally tried to show the application of the facts he had learned about air-floating to aeronautics, and was scoffed at. Now we appropriate at once sixteen million dollars for such flying machines, to keep abreast of those who are using the principles disclosed by Langley.

But Langley's work, so far as his support by the country went, was one of our best American near-successes. He, too, was a highly trained physicist. He was early a professor of astronomy and physics, and was long an experimenting student of meteorology, both at Pittsburgh and Washington. His efforts for a time were supported by the government, but this support was withdrawn at the critical period when a successful aeroplane, as we now realize, was apparently actually at hand. For only a part of his work on other matters, such as the extension of the invisible solar spectrum or the bolometer, we ought to have rewarded him by aiding him to develop those other subjects, like aerodromics, in which he excelled. Were his discoveries fortuitous? No. He was an active scientific investigator with years of training and experience.

A Swedish professor in a lecture once noticed that a wire carrying electricity made a magnetic needle move when brought near it. He studied this little thing because he liked it. Another professor, in France, quickly went on with this little phenomenon, finding out how electricity and magnets were related. Then a couple of Germans used the principle for communication at a distance, and we soon had electromagnetic telegraphy.

In addition to these, such men as our own Professor Henry contributed to the study of the electromagnet. Is it an accident that all of these men, Oersted, Ampere, Gauss, Weber, and Henry were in educational institutions, that they were mature and highly educated men? Perhaps the two names which first occur to the student of the electrical group are Volta and Galvani. Here again we have trained observers and teachers. Each of them, but two, was over forty when he did the work here referred to. I mention this to show that in such cases maturity and education has been common, and that we must get out of the way of thinking that great advances by original thought and work emanate usually from the young and untrained mind, or are accidents of time and environment.

Prior to the studies of Ampere, no one proposed using currents in wires acting on magnets as a scheme for communication. The post did that work satisfactorily. No one knew telegraphy as a *want* at all. The use followed after the discovery. The discovery was made by a trained scientist. It was studied by a scientist, and scientists later steered it into useful directions and engineers made it commercial.

Most Americans probably imagine the great utilities now depending on the use of steam as traceable to the discovery of a lad who observed the steam pressure exerted in the kettle at the home fireside and who, with a little tinkering, soon set up the steam engine. This is what our newspaper men call the personal touch, or human element which is so necessary to effective popular science. But the truth is sacrificed to please us, for a cent. Hero of Alexander apparently made the first steam engine. He was one of the greatest scientists, students, teachers, and writers of his day, and his results were the work of most advanced and careful experimentation, carried out with remarkable support and conveniences. The methods of development of new things in Hero's time (130 B. C.) are necessary today.

We find in the researches which led to the engine becoming the combination of a cylinder, piston, and condenser, the work of a professor at Marburg. He worked out the idea of the condenser. Apparently the aid of Robert Hooke, a professor at Gresham College, enabled Newcomen to improve Papin's apparatus, so that an engine for mine pumping re-

sulted, and then came Watt. He was aided by Glasgow professors, and the college gave him the position of mathematic instrument maker. In this position, with the help of the professor of chemistry, Black, and the professor of natural philosophy, Robison, he experimented on steam. He was at this work eight years before he made the advance of adding the vacuum principle to the earlier engines. It was not a flash of thought, but a long study.

And so I say, let us train more scientists, more men who can study new things and ask questions of Nature. We will be adequately supplied with good engineers, because the demand for them is obvious and the pay good.

It was a professor at Louvain, Minckelers, who apparently started us in the use of illuminating gas. He became interested in the distillation of coal. He was not aiming to illuminate houses, and his first uses gave no premonition of our present conditions. He was trying such gases in balloons, but he also tried lighting his lecture room by this means. The engineering development of this peculiar discovery did not take place for ten or more years, but it was the inquisitive mind of the trained physicist and chemist which made the engineering possible.

To take a well-known chemical field, review the fixation of nitrogen. The earliest work on the action of electric arcs in producing combination between the gases of the air, was the observations of professors Priestley and Cavendish, each of them a lifelong experimenter in chemistry and physics. They showed that nitric oxides are produced. The refinements of technical development were due to the experiments of Bradley and Lovejoy in America, of Birkeland and Eyde in Norway, and of Schoenherr and Pauling in Germany and Austria. Another of the fixation processes, the cyanamide, is traceable to the discoveries of Moissan, an experienced chemist and professor in Paris, who described the production of calcium carbide in the electric arc. It had been previously made, and the production of acetylene from it, by Wöhler, a teacher of chemistry in Leipzig, who put aluminium on the map of metals, and at the time of Moissan's discovery was also discovered in America, by Willson, who developed it commercially. That this carbide was useful for the fixation of nitrogen was found by Caro and Frank. Ostwald, one of the most active professors of physical chemistry, became interested in catalysis and studied the oxidation of ammonia to nitric acid, when this reaction had only scientific value, and yet it is now necessary for Germany in her manufacture of explosives. Professor Haber, another well equipped German teacher and investigator, also studied a number of gas reactions in the way which almost always puts the science, and sometimes the industries, ahead. He spent years studying and writing on the thermodynamics of gas reactions. His direct production of ammonia by synthesis is now possibly the world's simplest way of getting it, and from it, in turn, the very desirable nitric acid.

Surely there are many more just such widely interesting developments which only await the careful studies of the trained inquirer. The history of photography is filled with the names of chemical and physical investigators, most of whom contributed to this science only after long preparation in research work. Very little, or nothing seems here to have been accidental. Our position has resulted from gradual accretions of knowledge from many experimenters.

As we ride in our automobiles, we realize that the explosion type of engine marked a new epoch. On account of the proximity, we cannot estimate the value of this step. Apparently, like the use of illuminating gas or magnetic induction, this foundation was also laid in the professor's lecture room. The first explosion engine was apparently that of a Professor Farish, at Cambridge, in 1820. In this case he used hydrogen and air mixtures, but the step to other gases, or gasoline, was only one of refinement. We call it engineering after the principles are founded.

During the past few years we have had our pleasure constantly increased by the

thermos bottle. This may be a little step, but it must be attributed to the scientific work of a trained expert, Professor Dewar. His greatest service may be his work on the liquefaction of gases, but his need for such liquids as hydrogen prompted the development of the vacuum jacketed and silver coated glass apparatus now in daily use throughout the world.

We have already mentioned Davy, of the Royal Institute. His continued experiments led to many of the conveniences of today, but he also discovered and isolated the five metals, sodium, magnesium, calcium, barium, and strontium. His studies of fire damp and his safety lamp are also familiar, and his work on agricultural chemistry started the world on a line which is still under experiment. His attainments and those of his successor, Faraday, probably account for the permanency of publicly supported scientific research in England.

The Royal Institution of Great Britain maintains professors of natural philosophy, chemistry and physiology, and has good research laboratories under its direction. Other men who have been thus developed and maintained were Thomas Young, Tyndall, Franklin, and Rayleigh. Can any one question the wisdom of encouraging these particular men?

Any attempt to cover the marked disclosures of science would be incomplete without reference to the work of the German schools of organic chemistry. But here the modern results of organized effort are well known. The number of useful dyes is almost infinite. The byproducts in the way of new explosives, such as trinitro toluol, are familiar to all. So are countless medicinal products, like antipyrin and phenacetin, and special chemicals, such as photographic developers. There is surely no limit to the possibilities due to the careful and long continued studies of organic chemical reactions. The way the work was done is what insured its eternal usefulness.

The last contribution to our economies in artificial lighting was made possible by a little of the purely scientific researches of Rayleigh and Ramsay, than whom no scientists were better trained. Their discovery of argon later permitted its use in incandescent lamps to improve the quality of the best we then had.

In biochemical fields there are countless examples of the value to the race of keeping able research men at work on questions of human welfare, the cure and prevention of disease, etc. The immense field of immunity studies which in the past quarter century have seen the strides made by Pasteur, Ehrlich, Metchnikoff, and their students, cannot be expressed in ordinary measures of value. They have called for the life study of many good men, and any less preparation would have been inadequate.

I have omitted the names of many men who accomplished much for mankind by devoting their lives to scientific investigation, usually in connection with some school. The cases chosen, while selected at random, are some of the relatively simple ones. The monumental work of such men as Helmholtz, Newton, Maxwell, Liebig, Bunsen, Kelvin, and scores of others, could scarcely be briefly treated, but in all of them the value of long continued application in new fields of physical knowledge is plain. They were all given time, opportunity, and support for the public good.

Readers of *Popular Mechanics* some time ago selected by vote the seven wonders of the modern world. The highest votes were received by wireless, the telephone, aeroplane, radium, antiseptics, antitoxins, spectrum analysis, and X-rays. How were these originated? All of them were produced by the identical formula. In the first place, they were not the result of a direct attempt to accomplish what was really attained. The end was not visible when the foundations were laid. The real work was done by thoroughly well trained observers—not by laymen. They were professors in every case. They followed up a lead opened by an observation which was too insignificant to attract the attention of less trained men. The results now form a large portion of our human inventory, and we ask: Are other such additions possible? The answer is certainly, Yes, and by the same method.

These disclosures are portions of an infinite nature. They seem insignificant until some strenuous and highly studious efforts are expended upon them, and then it slowly becomes apparent that they fit perfectly into our needs. Just as we could not have foreseen them, so we cannot foresee their followers, but with the extensions of knowledge the possibilities continually increase. The limitations are in us and in our vision. We will get ahead in proportion to our training for extending the realms of natural knowledge, and we will grow in proportion to our applications of modern methods used at the advancing boundary between known and unknown. This is the way it has always been done.

Raymond B. Price, '94, who had just returned from a close view of the various phases of the war in Europe, described the condition of England and France at the beginning of the war, and urged preparation on the part of America.

RAYMOND B. PRICE

Mr. Price said in part, "Of all the faces I glanced at during my visit to the Allied front, I did not see a single one with a grouch on it. The morale and conduct on the firing line is wonderfully inspiring. The men are a determined lot, confident of victory.

"The war in a certain sense has helped the working class of England for it has forced the government to try to understand the laboring classes and to straighten out their difficulties and misunderstandings. As a result we find the working conditions and home conditions of the laborer greatly improved, for England has learned that the efficiency of the laborer is dependent directly on his conditions of living.

"From a multitude of various factories, all endeavoring in their own way to manufacture for the needs of the government, England has completely reorganized and developed a well-regulated and almost perfect system of production. The same may be said of all the Allied nations. The questions which I have heard asked most often are, 'How is this tremendous increase in production due to the efficient reorganization of the industries going to affect the world's markets after the war is over?' and, 'Can this increase in production be taken care of, and how will it affect international trade?' They are serious questions to which much thought has been given abroad. A commission was appointed to investigate, and in their report they favored a specialization of manufactures by the different nations. Goods were to be manufactured in that country which an international committee would decide was in a position to do it most efficiently, and in this way only the necessary supply would be produced.

"America has already been approached on the subject but has turned a deaf ear to the proposition, with the result that she is looked upon by many as a selfish nation who is sucking the blood out of those who should be her friends, and at a time when they can least resist.

"At present over 80 per cent. of the profits of all industries is being taken by the government and it is almost an assured fact that this tax will continue for many years after the war is over. This alone has been an important factor in England's efficient reorganization of her industries. It has been instrumental in calming the differences between capital and labor, for the laboring classes now feel that excessive profits by a few is impossible. This complete reorganization of industrial forces has been going on in all the belligerent countries, and when the war is over America will have a hard task to compete with the industrial organizations of Europe."

The last speaker introduced was Francis R. Hart, treasurer of the Institute, and president-elect of the Alumni Association. Mr. Hart gave some very interesting figures connected with the finances of Technology. He said in part:—

EXTRACTS FROM MR. HART'S REMARKS

"When, at the time of Doctor Maclaurin's inauguration in June, 1909, we welcomed him to his first alumni dinner, the Institute had on its books invested funds, exclusive of buildings, of two and one-half million dollars; in addition it

owned the land and buildings in Boston with which we are all so familiar. On the books of the treasurer today, we have total invested funds of nearly $8,000,000, and buildings and equipment on the other side of the river amounting approximately to $7,100,000, or $15,000,000 of property in all, without counting the Rogers and Walker buildings.

"The remark of Ambassador Brice at Doctor Maclaurin's inauguration in 1909 to the effect that 'the Scotch are a great people and we know they are because they admit it themselves' does not apply to President Maclaurin. He does not only not call himself great, but he does not think himself great. It is not because of his marvelous gift of getting things done that he is loved by all his associates on the Corporation, Faculty staff, and by the whole body of alumni, it is because of his compelling earnestness and simplicity and because of his many other lovable qualities, which but for his presence here I would tell you more about."

Mr. Hart gave a record of the gifts to the Institute through bequests, alumni funds and generous living benefactors from the beginning of the academic year ending in 1910 to January 6, 1917, as follows:

RECORD OF GIFTS TO THE INSTITUTE

Year ending 1910	$107,000.00
" " 1911	66,000.00
" " 1912	2,337,000.00
" " 1913	1,312,000.00
" " 1914	852,000.00
" " 1915	877,000.00
" " 1916	2,322,000.00
July 1, 1916–Jan. 6, 1917	4,627,000.00
	$12,500,000.00

He also stated a few of the interesting figures of the cost of educating students per year, and has given to the REVIEW a statement from which his figures were derived and which is appended hereto.

It is to be noted that the yearly cost per student includes no allowance for interest upon the investments, land, buildings and equipment, and no allowance for depreciation of property or apparatus.

The following table, which covers the period since the Institute was founded, shows the annual cost of educating students:

MASSACHUSETTS INSTITUTE OF TECHNOLOGY—YEARLY COST PER STUDENT

Year Ending	*No. Students*		*Expenses*	*Expense per Student*
1866	72		$12,654.72	$175.76
1867	137		17,313.65	126.38
1868	167		28,767.90	172.26
1869	172		39,111.27	227.39
1870	206		50,107.10	243.24
1871	224		47,152.33	210.50
1872	261		58,182.73	222.92
1873	348		104,314.76	299.75
1874	276		74,634.69	270.42
1875	248		82,223.23	331.54
1876	255		71,227.13	279.32
1877	215		74,338.71	345.76
1878	194		80,910.63	417.06
1879	188		76,154.31	405.07
1880	203		60,758.39	299.30
1881	253		72,574.52	286.86
1882	302		83,864.35	277.70
1883	368		105,127.30	285.67
1884	443		164,095.44	370.42
1885	579		170,305.47	294.14
1886	609		171,841.93	282.17
1887	637		172,580.46	270.93
1888	720		201,859.02	280.36
1889	827		203,504.74	246.08
1890	909		223,165.74	245.51
1891	937		238,676.91	254.72
1892	1,011		267,547.90	264.64
1893	1,060		296,877.95	280.07
1894	1,157		295,332.33	255.26
1895	1,183		307,247.10	259.72
1896	1,187		318,976.01	268.72
1897	1,198		327,063.94	273.01
1898	1,198		338,170.08	282.29
1899	1,171		367,459.64	313.80
1900	1,178		355,726.01	301.97
1901	1,277		377,423.92	295.87
1902	1,415		409,029.40	289.07
1903	1,608		473,240.59	294.30
1904	1,528		501,461.17	328.18
1905	1,561		482,429.61	309.05
1906	1,466		508,407.21	346.79
1907	1,397		510,069.50	365.12
1908	1,415		536,393.77	379.07
1909	1,462		575,794.35	393.84
1910	1,481		589,915.54	398.37
1911	1,509	(9 mos.)	493,463.36	327.01
1912	1,566		622,089.68	397.25
1913	1,611		639,919.52	397.22
1914	1,685		659,905.32	391.64
1915	1,816		678,782.18	373.78
1916	1,900		708,655.13	372.98

PRESIDENT STONE

President Stone's address was as follows:

Last June Technology celebrated her fiftieth anniversary. Each year for fifty years she has made her contribution of trained alumni to our country. Can she perform a service now to our National

Government by so organizing her alumni as to assist in the movement for preparedness which is the great need of the hour? Your alumni association believes that she can and has committed herself to assist the Government through coöperation with the National Council of Research and the Council of National Defence.

Just at the close of the Civil War, Professor Rogers and a few broad-minded men in Boston realized that America's great need was for trained technical men prepared to attack and coördinate her great industrial problems. The mass of people in the United States neither understood nor appreciated its importance at that time. Half a century has rolled by during which all the great nations of the world have been engaged in a struggle for industrial supremacy and expansion. This has now culminated in the most disastrous war known to history, of which the end is not yet in sight. And now the need of preparedness, both industrial and military, which President Rogers foresaw is forcibly impressed upon every thinking man and woman of the United States.

That preparedness requires technical training is not always appreciated, but the fact remains that technical training is the foundation for both military and industrial preparedness. It is the technically trained men who are fighting the battles today, on the sea, on the land and in the air, and it is the technical men at home who are showing the way for maintaining the industries in the war-stricken countries. Even in the countries now at peace the technically trained man is more than ever before in demand, for it is he who must devise ways and means of providing substitutes for the many things they can no longer import.

In the summer of 1914 Germany was prepared when other nations were taken unawares by the war, but her preparedness did not alone consist of military and naval equipment and means of producing them, but of a large body of technically trained men ready to apply themselves to new scientific and industrial problems that were sure to arise. The orderly habit of the German mind had led the people to coördinate science and industry and when the need came each human unit of the great machine dropped automatically into its proper place and the German organization moved on like one great human being, creating, developing, producing whatever the country most needed. Months elapsed before the other great nations involved were able to bring order out of chaos and a great advantage had been gained for the Central Powers.

The lesson of preparedness has thus been learned. England, France, Italy and Russia are fully awake now to the importance of preparedness. Every one of the belligerent countries has already made preparations for rebuilding such works as have been destroyed by war and, more than that, in many cases elaborate preparations have been made for reëstablishing foreign and domestic commerce and industry at the close of the war. More than ever before our foreign neighbors are on the alert to develop their own resources and turn to their advantage those of other countries. Whether they wish or no, they will have to make extraordinary exertions to recoup the losses they have suffered in the war. Accustomed to frugal living and accustomed also to working as a unit under military discipline, every one of the belligerents will be effectively equipped for accomplishment as never before.

Wherein lies future hope for America in this world struggle? *First,* in our realization of the need of preparedness to meet conditions that will arise as soon as the war is over or in case we become involved. *Second,* in prompt action on the part of our scientific and technical men in pointing out the things that America most needs in order to maintain and develop her industrial activities. *Third,* in pointing out to our Government these needs and showing how help may be secured.

When the war broke out we were without dyes and even after two years some of our great mills are closed because dyes and chemicals cannot be secured. Our men of science are working on this problem and we are making progress. We

are practically without nitrogen in America, and if our supply of nitrates from Chile was cut off we would be without nitric acid and hence without powder and high explosives. Our Government has awakened to the importance of this and has appointed an excellent commission to study the subject and show the way for producing it electrically. In this case the scientific man was clearly the first to be needed.

But it is not enough that America's scientists should discover the means, but the technical men must push the discovery to complete development and make it practical. Eternal vigilance is the price of success and more than ever will eternal vigilance be required in the future.

An American, Robert Fulton, built the first steamboat, but we lost the art, or at least the means, of efficient steamship construction in this country for no good reason other than a foolish and short-sighted policy adopted toward shipping by our Federal Government. For years we have been able to build locomotives better and cheaper than other countries. For years we have been able to build bridges and steel structures cheaper than other countries. A steamship is a steel structure with a great locomotive to drive it, and as we could build the component parts cheaper than foreigners we ought to have been able to build the whole, but foreign governments fostered their shipbuilding industry while our Government handicapped ours. Hence, we built no ships and owned no ships, and foreigners controlled our foreign commerce. To the danger of this, our own people have hardly yet awakened. In spite of this country's apathy on the shipbuilding question, Technology has for years been turning out men with special knowledge of shipbuilding problems and thus contributing to preparedness for one of our biggest industrial problems of the future.

This is but one example and there are countless other problems in which Technology men can be of untold service to our Government and our country. And the reason lies in the fact that the scientifically trained man learns the art of intelligent research and acquires the power of analysis. He can ascertain the means by which certain results can be obtained. Besides this he can intelligently point out cause and effect to our people and our Government, thereby fostering development of our industries and showing means of accomplishment. In short the scientific and technical men of any country can more than any other class of men prepare the way and help develop those things which make a nation great, advance her prosperity and prepare for the future.

Let the Massachusetts Institute of Technology be the school whose alumni and Faculty shall lead the way that others may follow.

Names President Maclaurin

As members of the Board of Visitors which annually advises with officials of the Naval Academy regarding the curriculum, President Wilson has appointed President Maclaurin of Massachusetts Institute of Technology, Van Hise of the University of Wisconsin, Wheeler of the University of California, Alderman of the University of Virginia, Humphrey of Stevens Institute and Dabney of the University of Cincinnati and Dean Sills of Bowdoin.

A Signal Honor

The design of William B. Colleary, a Boston boy, of the class of '17, received first prize from the Societe des Architectes Diplomes of France and was chosen as a memorial to the artists who have died for France in the present war. The memorial is in the form of a ceiling of monumental design, and is to be erected in a room of the École des Beaux Arts in Paris. The prize is a gold medal which will probably be presented to Colleary at the Commencement banquet.

Colleary is the son of Mr. and Mrs. B. F. Colleary of 300 Hyde Park avenue, Forest Hills. He was born in Marlboro and was graduated from Holy Cross College, Worcester, in 1913. He was a member of the track team for four years and made his 'varsity football letter in 1911.

PROBLEM OF THE MOBILIZATION COMMITTEE

The Alumni Committee on Mobilization of Technology's Resources has a problem before it quite different from that of the alumni of most colleges.

In case of a declaration of war, the temptation to enlist would affect our alumni as well as others, and actual enlistment might remove a large number of men whose best work might lie in the field of producing supplies for the men at the front. It is obvious that we are unprepared for war on a large scale and it is equally obvious that these preparations consist primarily in munitions, accoutrements, camp and hospital equipment, ships, railroads, etc. Indeed, it has almost seemed to the committee that it would be desirable to warn alumni against enlisting generally with a view to mobilizing them for the production of needed materials. This feature of the case is the one that has fully impressed itself upon the Government. It is concerning itself in a large way about the industrial and technical facilities and brains of the country with a view to mobilizing them back of the firing line.

It is true, of course, that a great many Tech men have had military and naval training, and their most important place would be in active service. Indeed, in case of a decided lack of officers later on, it might be found necessary to call upon men having had executive experience to fill out the ranks. It is unlikely, however, that the Government would call a man for this work who had been trained for work in the industrial field, the need is likely to be so much greater.

Another consideration that must be taken into account is the conditions that will prevail after the war is over.

So much is already known of the plans the European countries are making for regaining their prestige in industry after the war, that engineers and far-sighted business men are becoming more and more disturbed by the perilous condition of America. Germany has already organized for the event of peace, and is making a bid for trade in Spain and other neutral countries. The same effective military organization that has been directing Germany with almost superhuman efficiency will transfer its operations from the trenches to the factories and sales rooms, and by eliminating all unnecessary overhead expense and intervening profits and commissions, will produce manufactured goods with the least possible addition to the cost of the raw material. If England and France are to survive, they must adopt the same principles. What has been accomplished in Germany by militarism is being produced in England and France by the dire necessity of self preservation. It is not unlikely that some form of semi-military organization will be created for the purpose of collective buying, manufacturing and selling with close governmental coöperation. Transportation, both by land and sea, will be controlled by the same effective force. In these countries the individual has been practically effaced. Millions of men have given up their business, and must depend upon the government for employment when the war is over. The hope of every man is centered in the industrial success of his country, and every subject will make personal sacrifice to accomplish it. There will be absolute unity in the industrial, commercial and financial inter-relations of these nations.

With these unheard of conditions to face, America must be united and organized on a basis to meet this competition. The influence of the alumni—individually, and through professional societies and trade organizations—is very powerful. Undoubtedly one of the first things to be done is the creation of a Federal Industrial Commission by the organizations most interested; this committee to consist principally of engineers and to be on a permanent basis, and absolutely free from political influence.

In this field the Government can do but little. It is clearly a problem for the men who have had scientific or engineering training. The problem is to bring into coöperation all the elements of production as a harmonious unit. It is a reassuring fact that notwithstanding the lack of coöperation that has heretofore existed among manufacturing interests of this country, there has grown up within a few months an entirely different spirit which has shown itself in various ways. One of the most indicative is the creation of research laboratories supported by the different interests making up trade organizations, in which the results are the common property of the various members. Indeed, in some cases the results of these researches are published freely to the country, and it is this spirit which must eventually prevail if we are to reach the desired objective.

It will be seen from the above that we have a complex problem before us and apparently the best procedure of the committee will be to index each man, particularly with reference to his place in case war is declared, but with the definite view of finding out his general experience with reference to conditions that may exist after the war.

Engineering Administration Theses

The following list of provisional theses subjects to be given to the new Course XV Engineering administration, will indicate to some extent, the breadth of the work of this department. The subjects are as follows:—

Althouse, A. K. Briquetting of Coal; Barrows, S. R. (With Shand). The Systematizing of a Small Machine Shop Manufacturing Shoe Machinery; Batchelder, S. S. (With duPont). Diesel Engine; Brooks, E. P. The Study of a Wholesale Hardware Business with Special Reference to the Handling and Recording of the Merchandise; Butterfield, F. H. (With Wells). Determination of Machine Hour Rate at Standard Woven Fabric Company, at Walpole; Erb, R. C. The Design and Layout of a Tool Room, Including Control of Tools in Factory, in the United Injector Company of Roxbury, Mass.; Gargan, J. Layout of Stores Room of United Injector Company; Hill, L. T. The Corrugation of Steel Rails; Holden, D. F. (With Stockman). Design and Installation of a System of Tool and Material Control for a Machine Shop Employing 200 Men; Littlefield, W. J. Comparison of Cost of Operation with Private Power Plant or Purchase of Power from Central Station; Low, C. E. Refrigeration Used for Heating; Lowengard, R. O. The Effect of Conditions on Azo Couplings; McGrady, L. L. (With Moody). Determination, for a Gas Plant Increasing its Output, of the Relative Costs of Extracting Benzoe from Illuminating Gas by Increasing the Rate of Washing or by Installing New Units; McNeill, W. I. (With Tools). The Installation of a Cost Accounting System for an Establishment Manufacturing Doors, Windows, Blinds and Interior Finish; Mann, H. G. Standardization of the Methods and Records of the Employment Department of Manufacturing Concerns; Medding, W. L. (With Strout). An Investigation of the Economy of Various Types of Coaling Plants at Railway Terminals; Moody, A. E. (With McGrady). Determination, for a Gas Plant Increasing its Output, of the Relative Costs of Extracting Benzoe from Illuminating Gas by Increasing the Rate of Washing or by Installing New Units; Shand, R. G. (With Barrows). The Systematizing of a Small Machine Shop Manufacturing Shoe Machinery; Stevens, R. S. (With Stewart). An Investigation of the Advisability of Installing a Power Plant at the E. B. and S. Co., with Recommendations for Power Equipment; Stewart, H. R. (With Stevens). An Investigation of the Advisability of Installing a Power Plant at the E. B. and S. Co., with Recommendations for Power Equipment; Stockman, E. B. With Holden). Design and Installation of a System of Tool and Material Control for a Machine Shop Employing 200 Men; Strout, H. E. (With Medding). An Investigation of the Economy of Various Types of Coaling Plants at Railway Terminals; Tapley, W. L. A Stores System

for a Small Shoe Factory; Toole, H. S. (With McNeill). The Installation of a Cost Accounting System for an Establishment Manufacturing Doors, Windows, Blinds and Interior Finish; Wells, E. D. (With Butterfield). Determination of Machine Hour Rate at Standard Woven Fabric Company at Walpole; Houghton, S. P. (With Marsilius). Belting; Marsilius, N. M. (With Houghton). Belting.

Tech Women Elect Officers

Miss Mabel Babcock was elected president for 1917 of the Technology Women's Association last month at the seventeenth annual meeting and luncheon at the New Tech, Cambridge. Other officers chosen were:

First vice-president, Mrs. Evelyn W. Ordway, 1917–19; second vice-president, Miss T. F. Hyams; corresponding secretary, Miss Elizabeth B. Babcock, 1917–19; recording secretary, Miss Clara P. Ames, and treasurer, Miss Annie E. Allen, 1917–19.

The meeting was held in the Emma Rogers and Margaret Cheney reading rooms, and was followed at one o'clock by the luncheon, at which the secretary, Miss Lillie C. Smith presided.

The speakers were: Francis R. Hart, president of the Alumni Association; Walter Humphreys, secretary of the Alumni Association; Captain Hovgaard of the Tech department of naval architecture, who talked on "Preparedness," and Dr. Hamilton F. Rosenau of the department of health.

Tech Man Mexican Ambassador

Ygnacio Bonillas, '84, who was one of General Carranza's representatives on the Mexican-American joint commission, has been made ambassador from Mexico to the United States.

After the failure of the Mexican-American commission to effect an adjustment of the questions at issue between the two governments Mr. Arredondo, formerly in charge of the Mexican embassy, was called to Mexico. It was understood at that time that Mr. Bonillas would be chosen as his successor, although Mr. Arredondo insisted that he would return to his post.

Mr. Bonillas has been the minister of communications in General Carranza's cabinet since the formation of his government, and is one of the few men who are reputed to have the entire confidence of General Carranza. He was educated at the Institute and married an American woman.

Historical Exhibit

The Alumni Committee on Historical Exhibit would like to complete its file of class photographs. Those now on file are as follows:—Class, '68, '73, '84, '85, '90, '94, '95, '01, '02, '03, '05, '08, '15 and '16.

The photographs thus donated or loaned, will be placed on exhibition in the President's old office in Rogers Building now devoted to the historical exhibit.

In this connection, please remember that anything of historical value connected with the Institute will be gratefully received by this committee, of which Mr. James P. Munroe, 79 Summer street, Boston, is chairman. The collection is becoming very large and valuable, and your coöperation in making it still greater will be appreciated.

New Laboratory Ready

The new laboratory for testing gas engines has been completed and put into operation.

The equipment consists of representative types of internal combustion engines and in addition a number of testing blocks for special engines, which may be sent to the Institute for investigation, have been installed.

The building is a one-story structure with a balcony on the interior, which runs around three sides and is located east of the power station. A course in aerodynamics has been established at the Institute, and provisions have been in the new laboratory for testing aeroplane engines and propellers. Like the other buildings this laboratory represents the last word in facilities.